

**EBA1180 Mathematics for Data Science**  
**autumn 2023**  
**Exercises**

*I came to the position that mathematical analysis is not one of the many ways of doing economic theory: it is the only way.*

R. Lucas

**Lecture 19 – 20**

**Sec. 7.1, 6.9, 8.6-7:**

**Implicit differentiation. The second order derivative, convex/concave functions.**

Here are recommended exercises from the textbook [SHSC].

Section 7.1 exercise 1, 4, 6, 7a

Section 6.9 exercise 1-4

Section 9.6 exercise 1-4, 6a

Section 8.6 exercise 1-4

**Problem** Compute the expression for the derivative of  $f(x)$ .

a)  $f(x) = \sqrt{x^2 - 7x + 13}$

b)  $f(x) = xe^{0.1x^2}$

c)  $f(x) = (2x + 5)^{100}$

d)  $f(x) = \frac{\ln(x)}{x}$

## Answers

### Problem

$$\text{a) } f'(x) = \frac{2x - 7}{2\sqrt{x^2 - 7x + 13}}$$

$$\text{c) } f'(x) = 200(2x + 5)^{99}$$

$$\text{b) } f'(x) = \frac{1}{5}(x^2 + 5)e^{0.1x^2}$$

$$\text{d) } f'(x) = \frac{1 - \ln(x)}{x^2}$$